Selecting an LVDS Device / LVDS Families

Chapter 3

3.0.0 SELECTING AN LVDS DEVICE

3.1.0 GENERAL

National is continually expanding its portfolio of LVDS devices. The devices listed below are current at the time this book goes to press. For the latest list of LVDS devices, please visit our LVDS website at: **www.national.com/appinfo/lvds/**

On this site, you will find the latest LVDS datasheets, application notes, selection tables, FAQs, modeling information/files, white papers, LVDS News, and much much more! The Web is constantly updated with new documents as they are available.

Application questions should be directed to your local National Semiconductor representative or to the US National Interface Hotline: 1-408-721-8500 (8 a.m. to 5 p.m. PST).

LVDS products are classified by device types. Please see below for a short description of each device type and selection table that was current at the time this edition of the LVDS Owner's Manual was printed. Again, visit our web site for the latest information.

3.1.1 Do I need LVDS?

If Megabits or Gigabits @ milliwatts are needed, then LVDS may be the answer for you! It provides high-speed data transmission, consumes little power, rejects noise, and is robust. It is ideal for interconnects of a few inches to tens of meters in length. It provides an ideal interface for chip-to-chip, card-to-card, shelf-to-shelf, rack-to-rack or box-to-box communication.

3.1.2 Which part should I use?

If point-to-point or multidrop configuration is needed – see the LVDS Line Driver/Receivers or Channel Link Family.

If multipoint or certain multidrop configurations are needed – then Bus LVDS offers the technology best suited for these applications.

Parallel? Serialize? Or Serial? – depends upon the application. Small busses typically use the simple PHY parts. However, if the bus is wide, then serialization may make the most sense. Serialization provides a smaller interconnect and reduces cable and connector size and cost. For this application, refer to the Channel Link and also the Bus LVDS SER/DES parts.

3.2.0 LVDS LINE DRIVERS & RECEIVERS

LVDS line drivers and receivers are used to convey information over PCB trace or cable if;

1. You only have a few channels of information to transmit, or

2. Your data is already serialized.

The following table summarizes National's LVDS line drivers and receivers. These devices are also referred to as simple PHYs.

LVDS Driver/Receiver/Transceiver Products

Order Number	# Dr.	# Rec.	Sup. Volt.	Temp	Speed per Channel	Typ ~I_{CC}@ 1Mbps (mA)	Max I_{CC} Disabled (mA)	Driver Max tpd (ns)	Driver Max Ch Skew (ns)	Receiver Max tpd (ns)	Receiver Max Ch Skew (ns)	Package	Comments
DS90LV047ATM	4	0	3.3	Ind	>400Mbps	20	6	1.7	0.5	—	—	16SOIC	
DS90LV047ATMTC	4	0	3.3	Ind	>400Mbps	20	6	1.7	0.5	—	—	16TSSOP	
DS90LV048ATM	0	4	3.3	Ind	>400Mbps	9	5	—	—	2.7	0.5	16SOIC	
DS90LV048ATMTC	0	4	3.3	Ind	>400Mbps	9	5	—	—	2.7	0.5	16TSSOP	
DS90LV031ATM	4	0	3.3	Ind	>400Mbps	21	6	2.0	0.5	—	—	16SOIC	
DS90LV031ATMTC	4	0	3.3	Ind	>400Mbps	21	6	2.0	0.5	—	—	16TSSOP	
DS90LV032ATM	0	4	3.3	Ind	>400Mbps	10	5	—	—	3.3	0.5	16SOIC	
DS90LV032ATMTC	0	4	3.3	Ind	>400Mbps	10	5	—	—	3.3	0.5	16TSSOP	
DS90LV031BTM	4	0	3.3	Ind	>400Mbps	22	6	2.0	0.5	—	—	16SOIC	Available soon
DS90LV031BTMTC	4	0	3.3	Ind	>400Mbps	22	6	2.0	0.5	—	—	16TSSOP	Available soon
DS90LV032BTM	0	4	3.3	Ind	>400Mbps	10	5	—	—	3.0	0.5	16SOIC	Available soon
DS90LV017ATM	1	0	3.3	Ind	>600Mbps	7	—	1.5	—	—	—	8 SOIC	
DS90LV017M	1	0	3.3	Com	>155Mbps	5.5	—	6.0	—	—	—	8 SOIC	
DS90LV018ATM	0	1	3.3	Ind	>400Mbps	5.5	—	—	—	2.5	—	8 SOIC	
DS90LV019TM	1	1	3.3/5	Ind	>100Mbps	16/19	7/8.5	7.0/6.0	—	9.0/8.0	—	14 SOIC	
DS90LV027ATM	2	0	3.3	Ind	>600Mbps	14	—	1.5	0.8	—	—	8 SOIC	
DS90LV027M	2	0	3.3	Com	>155Mbps	9	—	6.0	—	—	—	8 SOIC	
DS90LV028ATM	0	2	3.3	Ind	>400Mbps	5.5	—	—	—	2.5	0.5	8 SOIC	
DS90LV031AW-QML	4	0	3.3	Mil	>400Mbps	21	12	3.5	1.75	—	—	16CERPAK	Mil spec
DS90C031TM	4	0	5	Ind	>155Mbps	15.5	4	3.5	1.0	—	—	16SOIC	
DS90C032TM	0	4	5	Ind	>155Mbps	5	10	—	—	6.0	1.5	16 SOIC	
DS90C031BTM	4	0	5	Ind	>155Mbps	15.5	4	3.5	1.0	—	—	16 SOIC	Pwr Off Hi-Z
DS90C032BTM	0	4	5	Ind	>155Mbps	5	10	—	—	6.0	1.5	16 SOIC	Pwr Off Hi-Z
DS90C031E-QML	4	0	5	Mil	>100Mbps	15.5	10	5.0	3.0	—	—	20 LCC	Military-883
DS90C032E-QML	0	4	5	Mil	>100Mbps	5	11	—	—	8.0	3.0	20 LCC	Military-883
DS90C031W-QML	4	0	5	Mil	>100Mbps	15.5	10	5.0	3.0	—	—	16Flatpack	Military-883
DS90C032W-QML	0	4	5	Mil	>100Mbps	5	11	—	—	8.0	3.0	16Flatpack	Military-883
DS90C401M	2	0	5	Ind	>155Mbps	4	—	3.5	1.0	—	—	8 SOIC	
DS90C402M	0	2	5	Ind	>155Mbps	4.5	—	—	—	6.0	1.5	8 SOIC	
DS36C200M	2	2	5	Com	>100Mbps	12	10	5.5	—	9.0	—	14 SOIC	1394 Link

Note: Evaluation boards utilize a quad driver/receiver pair to perform generic cable/PCB/etc LVDS driver/receiver evaluations, order number LVDS47/48EVK.

3.3.0 LVDS DIGITAL CROSSPOINT SWITCHES

For routing of high-speed point-to-point busses, crosspoint switches may be used. They are also very useful in applications with redundant backup interconnects for fault tolerance. This first device in this planned family of products is now available. It is a 2x2 Crosspoint that operates above 800Mbps and generates extremely low jitter.

LVDS Digital Crosspoint Switches

Order Number	Description	Supply Voltage	Speed	Number of Inputs	Number of Outputs	Package
DS90CP22M-8	2 x 2 800Mbps LVDS Crosspoint Switch	3.3V	800Mbps	2	2	16SOIC

3.4.0 LVDS CHANNEL LINK SERIALIZERS/DESERIALIZERS

If you have a wide TTL bus that you wish to transmit, use one of National's Channel Link devices. Channel Link will serialize your data for you, saving you money on cables and connectors and helping you avoid complex skew problems associated with a completely parallel solution. The following table summarizes National's Channel Link devices.

LVDS Channel Link Serializer/Deserializer Products

Order Number	Mux/Demux Ratio	Type	Supply Voltage	Clock Frequency	Max Throughput	Package	Comments	Eval Board Order Number
DS90CR211MTD	21:3	Transmitter	5	20-40MHz	840Mbps	48TSSOP		CLINK5V28BT-66
DS90CR212MTD	21:3	Receiver	5	20-40MHz	840Mbps	48TSSOP		CLINK5V28BT-66
DS90CR213MTD	21:3	Transmitter	5	20-66MHz	1.38Gbps	48TSSOP		CLINK5V28BT-66
DS90CR214MTD	21:3	Receiver	5	20-66MHz	1.38Gbps	48TSSOP		CLINK5V28BT-66
DS90CR215MTD	21:3	Transmitter	3.3	20-66MHz	1.38Gbps	48TSSOP		CLINK3V28BT-66
DS90CR216MTD	21:3	Receiver	3.3	20-66MHz	1.38Gbps	48TSSOP		CLINK3V28BT-66
DS90CR216AMTD	21:3	Receiver	3.3	20-66MHz	1.38Gbps	48TSSOP	Enhanced Set/Hold Times	CLINK3V28BT-66
DS90CR217MTD	21:3	Transmitter	3.3	20-85MHz	1.78Gbps	48TSSOP		See Note
DS90CR218AMTD	21:3	Receiver	3.3	20-85MHz	1.78Gbps	48TSSOP		See Note
DS90CR218MTD	21:3	Receiver	3.3	20-75MHz	1.575Gbps	48TSSOP		See Note
DS90CR281MTD	28:4	Transmitter	5	20-40MHz	1.12Gbps	56TSSOP		CLINK5V28BT-66
DS90CR282MTD	28:4	Receiver	5	20-40MHz	1.12Gbps	56TSSOP		CLINK5V28BT-66
DS90CR283MTD	28:4	Transmitter	5	20-66MHz	1.84Gbps	56TSSOP		CLINK5V28BT-66
DS90CR284MTD	28:4	Receiver	5	20-66MHz	1.84Gbps	56TSSOP		CLINK5V28BT-66
DS90CR285MTD	28:4	Transmitter	3.3	20-66MHz	1.84Gbps	56TSSOP		CLINK3V28BT-66
DS90CR286MTD	28:4	Receiver	3.3	20-66MHz	1.84Gbps	56TSSOP		CLINK3V28BT-66
DS90CR286AMTD	28:4	Receiver	3.3	20-66MHz	1.84Gbps	56TSSOP	Enhanced Set/Hold Times	CLINK3V28BT-66
DS90CR287MTD	28:4	Transmitter	3.3	20-85MHz	2.38Gbps	56TSSOP		See Note
DS90CR288MTD	28:4	Receiver	3.3	20-75MHz	2.10Gbps	56TSSOP		See Note
DS90CR288AMTD	28:4	Receiver	3.3	20-85MHz	2.38Gbps	56TSSOP		See Note
DS90CR483VJD	48:8	Transmitter	3.3	32.5-112MHz	5.37Gbps	100TQFP		CLINK3V48BT-112
DS90CR484VJD	48:8	Receiver	3.3	32.5-112MHz	5.37Gbps	100TQFP		CLINK3V48BT-112

Note: 85MHz eval boards will be available in the future. For immediate needs, use CLINK3V28BT-66 with 75 or 85MHz parts.

3.5.0 LVDS FPD-LINK

Use National's FPD Link to convey graphics data from your PC or notebook motherboard to your flat panel displays. The next table summarizes National's FPD Link devices. This family has been extended with the LVDS Display Interface chipset that provides higher resolution support and long cable drive enhancements. The LDI Chipset is ideal for desktop monitor applications and also industrial display applications. The FPD-Link receiver function is also integrated into the timing controller devices to provide a small single-chip solution for TFT Panels.

LVDS Flat Panel Display Link (FPD-Link) and LVDS Display Interface (LDI)

Order Number	Color Bits	Type	Supply Voltage	Max Clock Frequency	Clock Edge Strobe	Package	Comments	Eval Board Order Number
DS90CF561MTD	18-bit	Transmitter	5	40MHz	Falling	48TSSOP		FLINK5V8BT-65 *
DS90CR561MTD	18-bit	Transmitter	5	40MHz	Rising	48TSSOP		FLINK5V8BT-65 *
DS90CF562MTD	18-bit	Receiver	5	40MHz	Falling	48TSSOP		FLINK5V8BT-65 *
DS90CR562MTD	18-bit	Receiver	5	40MHz	Rising	48TSSOP		FLINK5V8BT-65 *
DS90CR581MTD	24-bit	Transmitter	5	40MHz	Rising	48TSSOP		FLINK5V8BT-65
DS90CF563MTD	18-bit	Transmitter	5	65MHz	Falling	48TSSOP		FLINK5V8BT-65 *
DS90CR563MTD	18-bit	Transmitter	5	65MHz	Rising	48TSSOP		FLINK5V8BT-65 *
DS90CF564MTD	18-bit	Receiver	5	65MHz	Falling	48TSSOP		FLINK5V8BT-65 *
DS90CR564MTD	18-bit	Receiver	5	65MHz	Rising	48TSSOP		FLINK5V8BT-65 *
DS90CF583MTD	24-bit	Transmitter	5	65MHz	Falling	56TSSOP		FLINK5V8BT-65
DS90CR583MTD	24-bit	Transmitter	5	65MHz	Rising	56TSSOP		FLINK5V8BT-65
DS90CF584MTD	24-bit	Receiver	5	65MHz	Falling	56TSSOP		FLINK5V8BT-65
DS90CR584MTD	24-bit	Receiver	5	65MHz	Rising	56TSSOP		FLINK5V8BT-65
DS90C363AMTD	18-bit	Transmitter	3.3	65MHz	Programmable	48TSSOP		FLINK3V8BT-65 *
DS90CF363AMTD	18-bit	Transmitter	3.3	65MHz	Falling	48TSSOP		FLINK3V8BT-65 *
DS90CF364MTD	18-bit	Receiver	3.3	65MHz	Falling	48TSSOP		FLINK3V8BT-65 *
DS90CF364AMTD	18-bit	Receiver	3.3	65MHz	Falling	48TSSOP	50% CLKOUT	FLINK3V8BT-65 *
DS90C383AMTD	24-bit	Transmitter	3.3	65MHz	Programmable	56TSSOP		FLINK3V8BT-65
DS90CF383AMTD	24-bit	Transmitter	3.3	65MHz	Falling	56TSSOP		FLINK3V8BT-65
DS90CF384MTD	24-bit	Receiver	3.3	65MHz	Falling	56TSSOP		FLINK3V8BT-65
DS90CF384AMTD	24-bit	Receiver	3.3	65MHz	Falling	56TSSOP	50% CLKOUT	FLINK3V8BT-65
DS90C365MTD	18-bit	Transmitter	3.3	85MHz	Programmable	48TSSOP		See Note *
DS90CF366MTD	18-bit	Receiver	3.3	85MHz	Falling	48TSSOP		See Note *
DS90C385MTD	24-bit	Transmitter	3.3	85MHz	Programmable	56TSSOP		See Note
DS90CF386MTD	24-bit	Receiver	3.3	85MHz	Falling	56TSSOP		See Note
DS90C387VJD	48-bit	Transmitter	3.3	112MHz	Programmable	100TQFP		LDI3V8BT-112
DS90C387AVJD	48-bit	Transmitter	3.3	112MHz	Programmable	100TQFP	Non-DC Balanced	NA
DS90CF388VJD	48-bit	Receiver	3.3	112MHz	Falling	100TQFP		LDI3V8BT-112
DS90CF388AVJD	48-bit	Receiver	3.3	112MHz	Falling	100TQFP	Non-DC Balanced	NA

* For 18-bit evaluation, use 24-bit board for evaluation purposes.
Note: 85MHz eval boards will be available in the future. For immediate needs, FLINK3V8BT-65 can be used with 85MHz part.

LVDS Flat Panel Display Timing Controller Products

Order Number	Color Bits	Resolutions Supported	Supply Voltage	Max Clock Frequency	TCON Core	Package	Input/Output	Eval Board Order Number
FPD85310VJD	6 or 8	XGA/SVGA	3.3	65MHz	Programmable	TQFP	LVDS input/TTL dual port output	Call
FPD87310VJD	6 or 8	XGA/SVGA	3.3	65MHz	Programmable	TQFP	LVDS input/RSDS single port output	Call

Note: FPD8710 in sampling phase.

3.6.0 BUS LVDS

Bus LVDS is an extension of the LVDS line drivers and receivers family. They are specifically designed for multipoint applications where the bus is terminated at both ends. They may also be used in heavily loaded backplanes where the effective impedance is lower than 100Ω. In this case, the drivers may see a load in the 30 to 50Ω range. Bus LVDS drivers provide about 10mA of output current so that they provide LVDS swings with heavier termination loads. Transceivers and Repeaters are currently available in this product family. A "10-bit" Serializer and Deserializer family of devices is also available that embeds and recovers the clock from a single serial stream. This chipset also provides a high level of integration reducing complexity and overhead to link layer ASICs. Clock recovery and "Random Lock" digital blocks are integrated with the core interface line driving and receiving functions. The Deserializer (DS92LV1212/1224) can also be hot-plugged into a live data bus and does not require PLL training.

Special functions are also being developed using BLVDS/LVDS technology. This family provides additional functionality over the simple PHY devices. Currently a special low-skew clock transceiver with 6 CMOS outputs (DS92CK16) and a Repeater/MUX with selectable drive levels (DS92LV222A) are available.

Bus LVDS Products

Order Number	Description	Supply Voltage	Speed	Features	Package
DS92LV010ATM	Single Bus LVDS Transceiver	3.3/5	155Mbps/Ch	3.3V or 5V Operation	8SOIC
DS92LV222ATM	Bus LVDS or LVDS Repeater/Mux	3.3	200Mbps/Ch	Repeater, Mux, or 1:2 Clock Driver Modes	16SOIC
DS92LV090ATVEH	9-Channel Bus LVDS Transceiver	3.3	200Mbps/Ch	Low Part-to-Part Skew	64PQFP
DS92LV1021TMSA	10:1 Serializer w/Embedded Clock	3.3	40MHz	400Mbps Data Payload Over Single Pair	28SSOP
DS92LV1210TMSA	1:10 Deserializer w/Clock Recovery	3.3	40MHz	400Mbps Data Payload Over Single Pair	28SSOP
DS92LV1212TMSA	1:10 Random Lock Deserializer w/Clk Recovery	3.3	40MHz	400Mbps Data Payload Over Single Pair	28SSOP
DS92LV1023TMSA	10:1 Serializer w/Embedded Clock	3.3	66MHz	660Mbps Data Payload Over Single Pair	28SSOP
DS92LV1224TMSA	1:10 Random Lock Deserializer w/Clk Recovery	3.3	66MHz	660Mbps Data Payload Over Single Pair	28SSOP
DS92CK16TMTC	1:6 Clock Distribution	3.3	125MHz	50ps TTL output channel-to-channel skew	24TSSOP
More to come…					

3.7.0 SUMMARY

Over 75 different LVDS products are currently offered by National. For the latest in product information, and news, please visit National's LVDS web site at: **www.national.com/appinfo/lvds/**

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